

WARMING COMPOSITION FOR FOOD AND DRINK OR FOR ORAL CARE  
PREPARATION

FIELD OF THE INVENTION

5           This invention relates to a warming composition  
for food and drink or for oral care preparations which  
produces an excellent and long-lasting warming effect and  
causes no or little irritation to mucous membranes, a  
flavor composition for food and drink or for oral care  
10 preparations which comprises the warming composition, and  
beverages or oral care preparations which contain the  
warming composition or the flavor composition.

BACKGROUND OF THE INVENTION

15           Substances which are known to provide a sensation  
of warmth on application and called "warming agents"  
include polyhydric alcohols, capsicum (red pepper)  
powder, a capsicum tincture, capsicum extract, capsaicin,  
homocapsaicin, homodihydrocapsaicin, nonanoyl vanillyl  
amide, nonanoic acid vanillyl ether, vanillyl alcohol  
20 alkyl ether derivatives (JP-A-57-9729), such as vanillyl  
ethyl ether, vanillyl butyl ether, vanillyl pentyl ether,  
and vanillyl hexyl ether, isovanillyl alcohol alkyl  
ethers, ethylvanillyl alcohol alkyl ethers, veratryl  
alcohol derivatives, substituted benzyl alcohol  
25 derivatives, substituted benzyl alcohol alkyl ethers,  
vanillin propylene glycol acetal, ethylvanillin propylene

glycol acetal, ginger extract, ginger oil, gingeol, and gingeron.

The warming composition is added either directly as such or in the form of a flavor composition to beverages and oral care preparations to produce a warming effect. However, the known warming agents often cause strong irritation on mucous membranes or exhibit insufficient warming effects, and those having high warming effects are of short duration or, when used in a reduced amount, have insufficient warming effects or an insufficient duration of effect.

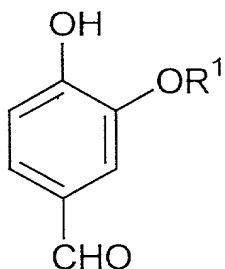
An object of the present invention is to provide a warming composition for food and drink and for oral care preparations which is freed of these problems, i.e., causes no or little mucous membrane irritation and exhibits an excellent and long-lasting warming effect in a small amount.

Another object of the present invention is to provide a flavor composition which causes no or little mucous membrane irritation and imparts a long-lasting warming effect when added in a small amount.

Still another object of the invention is to provide foods, beverages, and oral care preparations which contain the warming composition or the flavor composition and exhibit excellent and long-acting warming effects.

As a result of extensive investigations, the inventors have found that a combination of a compound or a composition that has been known as a cooling agent (hereinafter inclusively referred to as a cooling agent) and a small amount of a compound represented by formula (I) (B) and/or a compound or a composition that has been known as a warming agent (hereinafter inclusively referred to as a warming agent) produces such a warming effect as is never expected from each of the components used alone and as lasts as long as 3 hours or even more, and, when added to a product, exhibits an appreciable warming effect in such a low concentration at which each component would not stimulate individually, making it possible to produce a warming effect with no skin irritation that has not heretofore been attained.

The present invention provides a warming composition for food and drink and for oral care preparations comprising (A) a cooling agent and (B) a compound represented by formula (I):



(I)

wherein R<sup>1</sup> represents a hydrogen atom, a methyl group or an ethyl group.

The present invention also provides a warming composition for food and drink and for oral care preparations comprising (A) a cooling agent and (C) a warming agent.

5           The present invention also provides a warming composition for food and drink and for oral care preparations comprising (A) a cooling agent, (B) a compound represented by formula (I), and (C) a warming agent.

10           The present invention also provides a flavor composition for beverage and food or an oral care preparation comprising any of the above-described warming compositions.

15           The present invention also provides a food, a beverage or an oral care preparation comprising any of the above-described warming compositions or the above-described flavor composition.

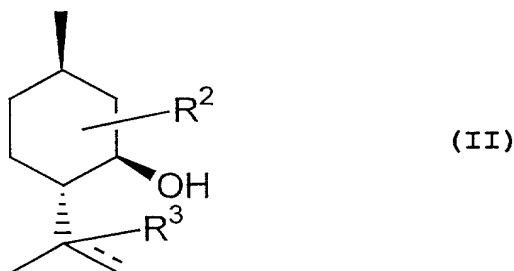
20           In the present invention, a combination of a cooling agent and at least one of a warming agent and a specific compound produces an appreciable warming effect at such a low concentration at which each component alone is ineffective. The warming effect of the warming composition of the invention lasts for a long period of time that has not been thought. The warming composition  
25           of the invention is unlike conventional ones in that when

it is applied to one's sole, the warming effect is also produced in her or his back, etc.

The warming composition of the present invention comprises (A) a cooling agent and at least one of (B) a compound represented by formula (I) and (C) a warming agent.

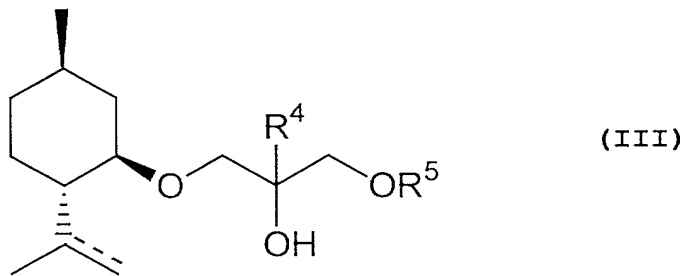
The cooling agent as component (A) can be any compound or composition known as a cooling agent. Typical examples of the cooling agents which can be used in the invention include:

(1) a compound represented by formula (II):



wherein  $R^2$  and  $R^3$  each represent a hydrogen atom or a hydroxyl group (--- represents a single bond or a double bond, the same definition applies hereinafter),

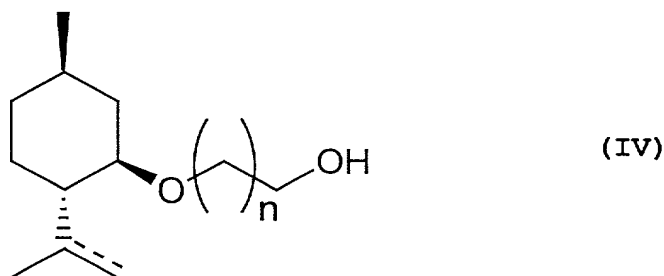
(2) a compound represented by formula (III):



wherein  $R^4$  represents a hydrogen atom or a methyl group;  
 $R^5$  represents a hydrogen atom, a lower alkyl group or a  
2-alkoxyethyl group,

(3) a compound represented by formula (IV):

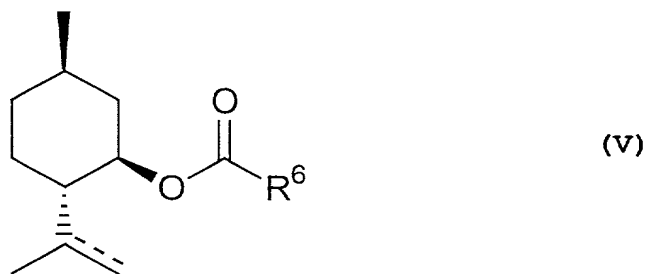
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wherein  $n$  represents an integer of 1 to 10,

(4) a compound represented by formula (V):

10



wherein  $R^6$  represents a hydrogen atom, a straight-chain  
or branched alkyl or alkenyl group, or a straight-chain  
or branched hydroxyalkyl group,

(5)  $\ell$ -menthylacetic acid N-ethylamide, and (6) N,2,3-

15 trimethyl-2-(1-methylethyl)-butanamide.

Specific examples of the cooling agents which are  
preferably used in the invention include, but are not  
limited to, menthol, isopulegol, 3-( $\ell$ -menthoxy)propane-  
1,2-diol, 3-( $\ell$ -menthoxy)-2-methylpropane-1,2-diol, p-

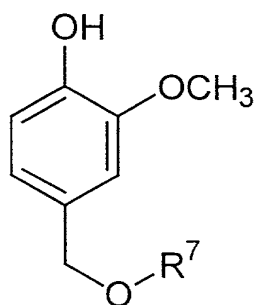
menthane-2,3-diol, p-menthane-3,8-diol, 6-isopropyl-9-methyl-1,4-dioxaspiro[4,5]decane-2-methanol, menthyl succinate and its alkaline earth metal salts, trimethylcyclohexanol, N-ethyl-2-isopropyl-5-methylcyclohexanecarboxamide, Japanese mint (*Mentha arvensis*) oil, peppermint oil, menthone, menthone glycerol ketal, menthyl lactate, 3-( $\ell$ -menthoxy)ethan-1-ol, 3-( $\ell$ -menthoxy)propan-1-ol, 3-( $\ell$ -menthoxy)butan-1-ol,  $\ell$ -menthylacetic acid N-ethylamide,  $\ell$ -menthyl-4-hydroxypentanoate,  $\ell$ -menthyl-3-hydroxybutyrate, N,2,3-trimethyl-2-(1-methylethyl)-butanamide, and spearmint oil.

Of these cooling agents preferred are 3-( $\ell$ -menthoxy)propane-1,2-diol, 3-( $\ell$ -menthoxy)-2-methylpropane-1,2-diol, p-menthane-3,8-diol, 3-( $\ell$ -menthoxy)ethan-1-ol, 3-( $\ell$ -menthoxy)propan-1-ol, and 3-( $\ell$ -menthoxy)butan-1-ol. Still preferred are 3-( $\ell$ -menthoxy)propane-1,2-diol and 3-( $\ell$ -menthoxy)-2-methylpropane-1,2-diol.

Of the compounds represented by formula (I) as component (B) the compound in which  $R^1$  is a methyl group, i.e., vanillin is preferred.

The warming agent as component (C) includes, but is not limited to,

(i) vanillyl alcohol, vanillyl alkyl or alkenyl ethers represented by formula (VI):



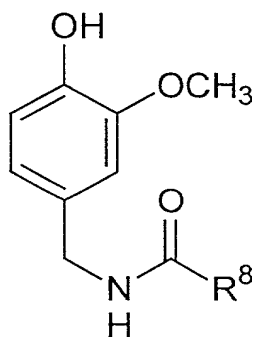
(VI)

wherein  $R^7$  represents a hydrogen atom or a straight chain or branched alkyl or alkenyl group having 1 to 10 carbon atoms, preferably 1 to 6 carbon atoms, such as vanillyl ethyl ether, vanillyl propyl ether, vanillyl butyl ether, vanillyl pentyl ether, and vanillyl hexyl ether;

(ii) vanillin propylene glycol acetal;

(iii) ethylvanillin propylene glycol acetal;

(iv) compounds represented by formula (VII):



(VII)

wherein  $R^8$  represents a straight-chain or branched alkyl or alkenyl group,

(v) gingeron, 4-(1-menthoxymethyl)-2-(3',4'-dihydroxyphenyl)-1,3-dioxolane, 4-(1-menthoxymethyl)-2-(2'-hydroxy-3'-methoxyphenyl)-1,3-dioxolan, capsicum



tincture, and ginger extract. Any other substances that have been used as a warming agent, including those described in the background of the present invention, can be used.

5           Of the above recited warming agents preferred are vanillyl ethyl ether, vanillyl propyl ether, vanillyl butyl ether, vanillyl pentyl ether, vanillyl hexyl ether, gingeron, capsicum tincture, and ginger extract. Still preferred are vanillyl butyl ether, vanillyl pentyl  
10 ether, vanillyl hexyl ether, and capsicum tincture. Vanillyl butyl ether is the most preferred.

          Component (B) is usually used in an amount of 0.000001 to 100 parts, preferably 0.0001 to 10 parts, still preferably 0.001 to 1 part, by weight per part by  
15 weight of component (A), and component (C) is usually used in an amount of 0.5 to 100 parts, preferably 0.5 to 10 parts, still preferably 0.5 to 1 part, by weight per part by weight of component (A). Where the warming  
composition comprises both components (B) and (C),  
20 components (B) and (C) are used in an a total amount of 0.000001 to 100 parts, preferably 0.0001 to 10 parts, by weight per part by weight of component (A). The weight ratio of component (C) to component (B) is preferably 0.01 to 100.

25           A preferred combination of components (A), (B), and (C) includes a combination of (A) 3-(1-

menthoxy)propane-1,2-diol or 3-(*l*-menthoxy)-2-methylpropane-1,2-diol and (B) vanillin and/or (C) vanillyl butyl ether. In this case, the combination usually comprises 0.0001 to 10 parts by weight, preferably 0.01 to 10 parts by weight, of component (B) and 0.5 to 5 parts by weight of component (C) each per part by weight of component (A).

The warming composition for food and drink or for oral care preparations, which comprises component (A) and components (B) and/or (C), may be diluted with a diluent safe to a human body, such as ethanol or pure water at an appropriate dilution decided according to the intended use, for example, about 1:2 to 1:10000.

The warming composition can be incorporated into a flavor composition for food and drink or oral care preparations. The flavor composition which can be used is not particularly limited, and any flavorings known in the art for use in foods, beverages or oral care products can be used. Examples of suitable flavorings include citrus flavors, such as an orange flavor, a lemon flavor, a lime flavor, a grapefruit flavor, a yuzu (Chinese lemon) flavor, and a *sudachi* flavor; fruit flavors, such as an apple flavor, a grape flavor, a strawberry flavor, a pineapple flavor, a banana flavor, a peach flavor, a melon flavor, an apricot flavor, an *ume* (Japanese apricot) flavor, a cherry flavor, a raspberry flavor, a

blueberry flavor, and a tropical fruit flavor; milk  
 flavors, such as a milk flavor, a butter flavor, a cheese  
 flavor, a cream flavor, and a yogurt flavor; a vanilla  
 flavor; tea or coffee flavors, such as a green tea  
 5 flavor, a oolong tea flavor, a tea flavor, a cocoa  
 flavor, a chocolate flavor, and a coffee flavor; mint  
 flavors, such as a peppermint flavor, a spearmint flavor,  
 and a Japanese mint flavor; spicy flavors, such as an  
 asafetida flavor, an ajowan flavor, an anise flavor, an  
 10 angelica flavor, a fennel flavor, an allspice flavor, a  
 cinnamon flavor, a camomile flavor, a mustard flavor, a  
 cardamon flavor, a caraway flavor, a cumin flavor, a  
 clove flavor, a pepper flavor, a coriander flavor, a  
 sassafras flavor, a savory flavor, a Zanthoxyli Fructus  
 15 flavor, a perilla flavor, a juniper berry flavor, a  
 ginger flavor, a star anise flavor, a horseradish flavor,  
 a thyme flavor, a tarragon flavor, a dill flavor, a  
 capsicum flavor, a nutmeg flavor, a basil flavor, a  
 marjoram flavor, a rosemary flavor, a bayleaf flavor, and  
 20 a wasabi (Japanese horseradish) flavor; meat flavors,  
 such as a beef flavor, a pork flavor, and a chicken  
 flavor; marine flavors, such as a fish flavor, a shell  
 flavor, a crustacean flavor, a dried and smoked fishes  
 flavor, and a seaweed flavor; alcoholic flavors, such as  
 25 a wine flavor, a whisky flavor, a brandy flavor, a rum  
 flavor, a gin flavor, and a liqueur flavor; floral

flavors; and vegetable flavors, such as an onion flavor, a garlic flavor, a cabbage flavor, a carrot flavor, a celery flavor, mushroom flavor, and a tomato flavor. For the details of compositions of these flavors, refer to Japanese Patent Office Gazette 12(2000)-1[7270], Known and Customary Techniques (Perfumes), II. Food Flavors. The warming composition of the invention can be used as a blending component or an additive component in flavor blending or as an additive after blending.

10           The warming composition or the flavor composition of the invention for food and drink and for oral care preparations can be used as an additive component to various products. The content of the warming composition in a final product is subject to wide variation according to the kind of the product, the amount of the product to be applied, the mode of use or application of the product, and the like. In general, the content of each of components (A), (B), and (C) in a final product can range from 0.000001 to 10%, preferably 0.0001 to 1%, still preferably 0.001 to 0.5%, by weight based on the final product. Component (A) and components (B) and/or (C) may be added to a product either separately with or without an appropriate solvent or in the form of a composition previously prepared from the components (i.e., the warming composition or the fragrance

composition). They may be added as compounding components in the course of producing the product.

The warming composition for food and drink or for oral care preparations of the present invention can be used in flavor preparations, food and drink, or oral care preparations as a component for providing sensation of warmth or a component for prolonging sensation of warmth.

The products to which the warming composition of the invention is applicable include, but are not limited to, food and drink, such as candies, drops, chewing gums, tablets, chocolates, cakes, cookies, snack food, bread, tea, coffee, juice, fruit drinks, fruit wine, dairy drinks, carbonated beverages, alcoholic beverages, seasonings, salad dressings, and dips; and oral care preparations, such as mouthwash, toothpaste, nebulizers, drinks, medicinal drops, gargles, and chewables.

In addition to the warming composition of the invention, these products can contain other additives according to use. For example, additives permitted by Food Sanitation Law can be added to food and drink according to necessity. Useful additives include saccharides, sweeteners, inorganic salts, emulsifiers, acidifiers, flavorings, colors, antioxidants, raising agents, thickeners, vegetable oils, milk, and other dairy products. In some detail, bakery products can comprise wheat flour (base), butter, a raising agent, e.g., baking

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powder, an emulsifier, e.g., a sucrose fatty acid ester, saccharides, e.g., sugar, inorganic salts, and flavorings. Chocolate can comprise cacao mass (base), cacao butter, saccharides, e.g., sugar, milk, and an emulsifier. Emulsified dressings can comprise salad oil, water, vinegar, sugar, thickening polysaccharides, and sweeteners. Chewing gum can comprise a gum base, saccharides, such as sugar, glucose and starch syrup, and flavors. Candy can comprise saccharides, acidifiers, e.g., citric acid, sweeteners, flavorings, and colors. Orange fruit drinks can comprise orange juice, sweeteners, e.g., isomerized sugars, acidifiers, e.g., citric acid, and antioxidants, e.g., vitamin C. Fruit milk drinks can comprise fruit juice, dairy products such as milk and powdered skim milk, saccharides, e.g., sugar, stabilizers, e.g., carboxymethyl cellulose, acidifiers, e.g., citric acid, and flavorings, e.g., a pineapple flavor.

Additives which can be used in the oral care preparations include inorganic salts, inorganic oxides, organic salts, thickeners, wetting agents, emulsifiers, surface active agents, humectants, alcohols, color additives, flavorings, and, if desired, medical ingredients such as crude drugs, hemostatics, circulation stimulants, antiinflammatory agents, astringents, antibacterial and/or antifungal agents, and bactericides.

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For example, toothpaste can comprise abrasives, such  
calcium phosphate, as calcium carbonate, aluminum  
hydroxide, silica, and calcium pyrophosphate; wetting  
agents, such as glycerin, sorbitol, and propylene glycol;  
5 tackifiers, such as carboxymethyl cellulose, carrageenan,  
and hydroxyethyl cellulose; surface active agents, such  
as sodium laurylsulfate, N-acylglutaminates, and sucrose  
fatty acid esters; sweeteners, such as saccharin sodium,  
stevioside, and xylitol; and medicinal components, such  
10 as vitamin E, azulene, aluminum chlorohydroxy  
allanthoinate, dextranase, hinokitiol, lysozyme chloride,  
and chlorhexidine.

The present invention will now be illustrated in  
greater detail with reference to Examples in view of  
15 Comparative Examples, but it should be understood that  
the invention is not limited thereto. Unless otherwise  
noted, all the percents are by weight.

Abbreviations used hereunder have the following  
meanings.

20 CA-10: 3-(*l*-Menthoxo)propane-1,2-diol  
TPG-1: 3-(*l*-Menthoxo)-2-methylpropane-1,2-diol  
TK-5: 3-(1-Methoxy)ethan-1-ol  
VBE: Vanillyl butyl ether

Particulars of commercially available products  
25 used hereunder are as follows.

NIKKOL HCO-60: Polyoxyethylene hydrogenated castor oil  
(60E.O.), available from Nikko Chemicals Co., Ltd.

EXAMPLES 1 TO 4 AND COMPARATIVE EXAMPLES 1 TO 4

Warming effect in hard candy:

- 5           A panel consisting of three healthy males and  
four healthy females ate a piece of hard candy weighing  
3 g having the formulation shown in Table 1 below and  
evaluated the warming effect and the irritation. The  
results of evaluation are shown in Table 1.



TABLE 1

Formulation (%)	Example 1	Example 2	Example 3	Example 4	Compara. Example 1	Compara. Example 2	Compara. Example 3	Compara. Example 4
Vanillin	0.005	0.005	-	0.005	-	-	0.005	-
VBE	-	-	0.005	0.005	-	-	-	0.005
CA-10	0.005	-	0.005	0.005	0.005	-	-	-
TPG-1	-	0.005	-	-	-	0.005	-	-
Granulated sugar	52.3	52.3	52.3	52.3	52.3	52.3	52.3	52.3
Starch syrup	46.6	46.6	46.6	46.6	46.6	46.6	46.6	45.6
Citric acid	1	1	1	1	1	1	1	1
Flavor	0.09	0.09	0.09	0.085	0.095	0.095	0.095	0.095
Effect								
Sensation during eating	almost nothing felt	almost nothing felt	comfortable tingling	comfortable tingling	nothing felt	nothing felt	nothing felt	comfortable tingling
Sensation after 30 mins.	warmth in the throat	nice warmth in the throat	warmth in the throat	nice warmth in the throat	nothing felt	nothing felt	nothing felt	nothing felt
Sensation after 1 hr.	warmth in the throat	nice warmth in the throat	warmth in the throat	warmth in the throat	nothing felt	nothing felt	nothing felt	nothing felt
Irritation	comfortable irritation	no irritation	weak irritation	weak irritation	no irritation	no irritation	no irritation	weak irritation

The candies of Comparative Examples 1 to 3 had no warming effect at all. The candy of Comparative Example 4 gave a tingling, which was attributed to VBE and comfortable to the mouth, which subsided gradually. The candies of Examples 1 to 4 produced the warming effect deep in the throat. Containing VBE, the candies of Examples 3 and 4 began to provide a tingling sensation attributed to VBE in the mouth during eating, which connected to long-lasting warmth felt deep in the throat.

EXAMPLES 5 TO 7 AND COMPARATIVE EXAMPLES 5 TO 8

Warming effect in chewing gum:

A panel consisting of three healthy males and four healthy females chewed gum weighing 3 g having the formulation shown in Table 2 below for 5 minutes and evaluated the warming effect and the irritation. The results of evaluation are shown in Table 2.

TABLE 2

Formulation (%)	Example 5	Example 6	Example 7	Compara. Example 5	Compara. Example 6	Compara. Example 7	Compara. Example 8
Vanillin	0.005	0.005	-	-	-	0.005	-
VBE	-	-	0.005	-	-	-	0.005
CA-10	0.005	-	0.005	0.005	-	-	-
TPG-1	-	0.005	-	-	0.005	-	-
Gum base	21	21	21	21	21	21	21
Powdered sugar	66	66	66	66	66	66	66
Starch syrup	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Citric acid	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Flavor	0.79	0.79	0.79	0.795	0.795	0.795	0.795
Effect							
Sensation during chewing	almost nothing felt	almost nothing felt	comfortable tingling	nothing felt	nothing felt	nothing felt	comfortable tingling
Sensation after 30 mins.	warmth in the throat	nice warmth in the throat	warmth in the throat	nothing felt	nothing felt	nothing felt	nothing felt
Sensation after 1 hr.	warmth in the throat	nice warmth in the throat	warmth in the throat	nothing felt	nothing felt	nothing felt	nothing felt
Irritation	comfortable irritation	no irritation	weak irritation	no irritation	no irritation	no irritation	weak irritation

1 The chewing gums of Comparative Examples 5 to 7  
had no warming effect at all. The gum of Comparative  
Example 8 gave the mouth a comfortable tingling owing to  
VBE, which disappeared gradually. The gums of Examples 5  
5 to 7 produced the warming effect deep in the throat.  
Containing VBE, the gum of Example 7 began to give a  
comfortable tingling attributed to VBE during chewing,  
which connected to a long-lasting sensation of warmth  
deep in the throat.

10 EXAMPLES 8 AND 9 AND COMPARATIVE EXAMPLES 9 TO 11

Warming effect in mouthwash:

15 A panel consisting of three healthy males and  
four healthy females held 10 ml of mouthwash having the  
formulation shown in Table 3 below in their mouth for  
10 seconds and then spat out to evaluate the warming  
effect and the irritation. The results of evaluation are  
shown in Table 3.

TABLE 3

Formulation (%)	Example 8	Example 9	Compara. Example 9	Compara. Example 10	Compara. Example 11
VBE	0.005	0.005	-	-	0.005
CA-10	0.005	-	0.005	-	-
TPG-1	-	0.005	-	0.005	-
95% Ethanol	5	5	5	5	5
Nicol HCO-60	2	2	2	2	2
Glycerin	10	10	10	10	10
Sodium benzoate	0.05	0.05	0.05	0.05	0.05
Purified water	82.94	82.94	82.945	82.945	82.945
Effect					
Sensation during washing	comfortable tingling	comfortable tingling	nothing felt	nothing felt	comfortable tingling
Sensation after 30 mins.	warmth in the throat	warmth in the throat	nothing felt	nothing felt	almost nothing felt
Sensation after 1 hr.	warmth in the throat	warmth in the throat	nothing felt	nothing felt	nothing felt
Irritation	comfortable irritation	comfortable irritation	no irritation	no irritation	comfortable irritation

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The mouthwashes of Comparative Examples 9 and 10 produced no warming effect at all. The mouthwash of Comparative Example 11 gave the mouth a comfortable tingling owing to VBE, which disappeared gradually. It was confirmed that the mouthwashes of Examples 8 and 9 give the mouth a comfortable tingling attributed to VBE, which connects to a long-lasting sensation of warmth deep in the throat.

The warming composition of the invention which comprises a cooling agent and a warming agent is incorporated into products to make the products exert an appreciable warming effect in such a low concentration at which each component would be ineffective when used individually. The warming composition makes it possible to produce a warming effect with no skin irritation that has not heretofore been attained. Further, the warming effect obtained by the present invention lasts long.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope thereof.

This application is based on Japanese patent application No. 2000-376814 filed December 12, 2000, the entire contents thereof being hereby incorporated by reference.